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- g. Configure router R1's Ethernet with IPX 802.2 and 802.3 raw frame types.
- h. Configure routers R3 and R4 to pass IPX Netbios type-20 broadcasts between their LAN interfaces.

5. DLSW Configuration – 10 pts (45 mins)

- a. Configure DLSW between router R3's interface token-ring 0 and router R4's interface Ethernet 0.
- b. Place router R2's interface Ethernet 0 into the DLSW network. Make sure there is connectivity between all LAN interfaces.
- c. Configure a filter that blocks Netbios packets with destination name "CCIERING1" from leaving router R3's interface To0.
- d. Setup a filter that would permit only SNA traffic between routers R3 & R4.

6. BGP Configuration – 15 pts (1 hour)

- a. Configure BGP on router R4 using AS number 1. Configure BGP on routers R1, R2, R3, and R5 using AS number 2. You can only use one neighbor X.X.X.X remote-as 2 command on routers R2 and R5.
- b. Configure two static routes to 172.168.1.0/24 and 172.168.2.0/24 using the command ip route 172.168.1.0 255.255.255.0 null 0 on router R4. Redistribute the second route into BGP using the route-map command.
- c. Make sure that router R5 can see the 172.168.2.0 route.
- d. Setup router R8 with BGP in AS number 3. On router R8 use the loopback interface Lo0 as the source for its BGP connection to AS 2. Make sure router R8 can see the specific 172.168.2.0 route, and not the aggregate 172.168.0.0

You have completed lab 3. Compare your configurations to the ones we provided. Often there is more than one to complete a task so your configurations may be different than ours. If your configurations are different than ours make sure you understand how to complete the lab with our configurations too.

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Lab#4

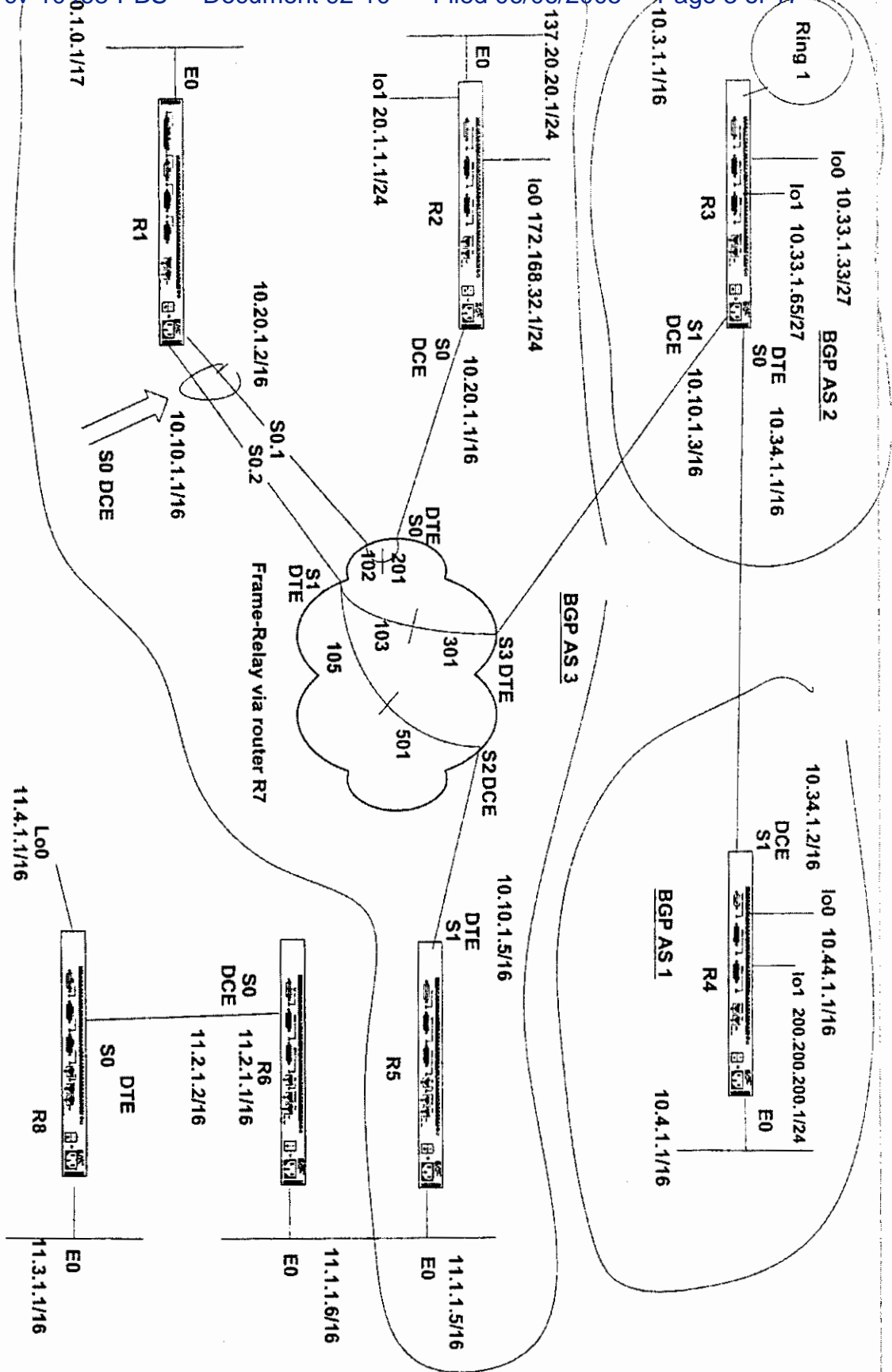
1-Day Format

Version 2.00

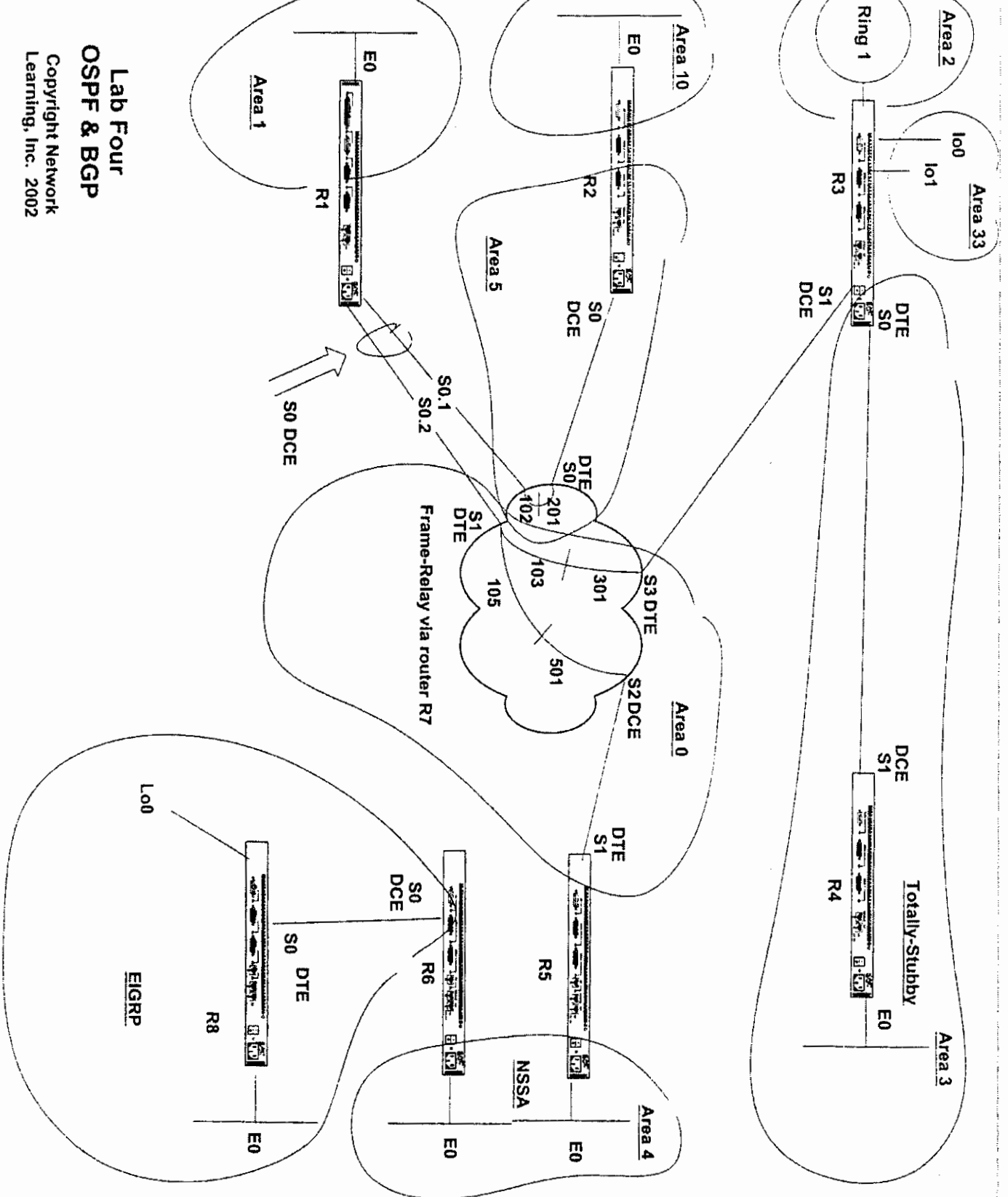
**OSPF
OSPF NSSA
OSPF Totally stubby areas
OSPF authentication
OSPF summarization
OSPF default route
Route redistribution
BGP with filtering & router reflectors
Frame Relay
Reverse Telnet
Sub-netting with subnet zero
IP EIGRP**

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Lab Four OSPF & BGP



Lab Four
OSPF & BGP
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2. OSPF & Other IP Routing Configuration

- Look at the routing table on R4 after it is a totally-stubby area.
- Don't forget that R6 needs to know how to get out of the area.
- Don't forget metrics during redistribution.
- Does area 10 touch area 0?

3. BGP Configuration

- What is your update source for BGP? How many hops away are the EBGP peers?
- How does BGP summarize routing information?
- Route-maps can be used to set metrics.
- Do your IBGP peers have full mesh connectivity?
- The BGP synchronization rule states that if an AS provides transit service to another AS, BGP should not advertise a route until all of the routers within the AS have learned about the route via an IGP.
- Do you have IGP route connectivity to all the required loopback interfaces in this lab?

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At the end of this lab verify connectivity to all ports. **You should be able to ping every interface from any router. (Don't worry about being able to ping a local frame-relay interface. Please disregard this statement if you are asked to filter packets, routes or other specific tasks.)**

1. Initial Configuration – 10 pts (30 mins)

- a. Use the pre-configuration files to apply proper IP addresses to the router interfaces. Add IP addresses as needed as shown on the network diagram. You may have to add additional IP addresses to complete some tasks.
- b. Connect routers R1, R2, R3, and R5 over the frame-relay. Configure router R1 using sub-interfaces. Configure routers R2, R3, and R5 without using sub-interfaces.
- c. Use only one frame-relay PVC on routers R2, R3, and R5. The recommended DLCI numbers 102, 201, 103, 301, 105, and 501 are indicated on the network diagram.
- d. Routers R1, R3, and R5 should share network 10.10.X.X 255.255.0.0 on their frame-relay interfaces.
- e. Routers R1 and R2 should share network 10.20.X.X 255.255.0.0 on their frame-relay interfaces.
- f. Router R1 should have network 10.1.X.X with a 9-bit subnet mask on its Ethernet interface. (The mask should be 255.255.128.0) Use subnet-zero here.)
- g. Router R2 should have network 137.20.20.0 with a 24-bit mask on its Ethernet interface.
- h. Router R3 should have network 10.3.X.X with an 8-bit subnet mask on its token-ring interface. (The mask should be 255.255.0.0)
- i. Use network 11.1.X.X 255.255.0.0 between routers R5 & R6.

2. OSPF & Other IP Routing Configuration – 35 pts (1hour 30 mins)

- a. Configure OSPF area 0 on the frame-relay interfaces between routers R1, R3, and R5.
- b. Place router R1's Ethernet in OSPF area 1. Place router R3's interface To0 in OSPF area 2.
- c. Place router R3's interface serial 0, and all of router R4 in OSPF area 3. Make OSPF area 3 a totally-stubby area.
- d. Place R5 and R6's Ethernet interfaces in OSPF area 4. Make this OSPF area a NSSA (not-so-stubby-area) Make the default cost 20.
- e. Configure router R6's interface serial 0 and router R8's interfaces S0, E0, and Loop0 for EIGRP.
- f. Place router R2's interface serial 0 and router R1's S0.1 in OSPF area 5.
- g. Redistribute all routes so that you can see all routes and ping from everywhere.

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- h. Summarize the routes for router R8's interfaces E0, Loop0, and S0 that were redistributed into OSPF by router R6 on router R5 so that all of router R8's networks appear as one route to the rest of the OSPF routers except R6.
- i. When you redistribute EIGRP into OSPF make these routes appear as type-1 external routes.
- j. Configure router R2 such that it propagates a default route to the other OSPF routers.
- k. Create a second loopback interface on router R2 with an address of 20.1.1.1/24. Make sure you can ping the second loopback interface on router R2 from other the routers.
- l. Create two loopbacks on router R3 with networks that could contain at most 30 hosts. Place the loopbacks on router R3 in one area and summarize such that one route appears for both loopbacks.
- m. Place the Ethernet interface on router R2 in area 10.
- n. Configure simple password authentication in OSPF area 4.
- o. Use the ip ospf priority command on router R5 to make it become the DR for OSPF area 4.
- p. Change the cost on router R5's interface E0 using an IP OSPF command to make it appear as 100Mbps as it relates to OSPF metrics.
- q. Change the cost on R6's E0 without using an IP OSPF command to make it appear as 100Mbps as it relates to OSPF metrics.

3. BGP Configuration – 15 pts (1 hour)

- a. Place router R4 in BGP AS 1 and router R3 in BGP AS 2. Create two static routes to null0 using a class A address with a 24-bit mask on R4 and inject into BGP such that router R3 can see it. Use loopbacks as the update source on both routers R3 and R4. Create loopback interfaces as necessary.
- b. Filter one of the statics routes with a route-map statement on router R4.
- c. Configure BGP on router R4 such that the sub-netted class A route is seen. For example, the BGP BGP route on router R3 could be 41.1.1.0 not 41.0.0.0.
- d. Configure a second loopback interface on router R4 at 200.200.200.1/24 and enable RIP on this router for this network. Inject this route and the previous one with a metric of 5.
- e. Configure routers R2, R1, and R5 in BGP AS 3. Use only one neighbor X.X.X.X remote-as X statement on routers R2 and R5.
- f. Create a static route on router R2 (ip route 22.1.1.0 255.255.255.0 null0.) Inject this route into BGP. Make sure the other routers running BGP can see this route.
- g. Also make sure all routers can ping 200.200.200.1.

You have completed lab 4. Compare your configurations to the ones we provided. Often there is more than one to complete a task so your configurations may be different than ours. If your configurations are different than ours make sure you understand how to complete the lab with our configurations too.

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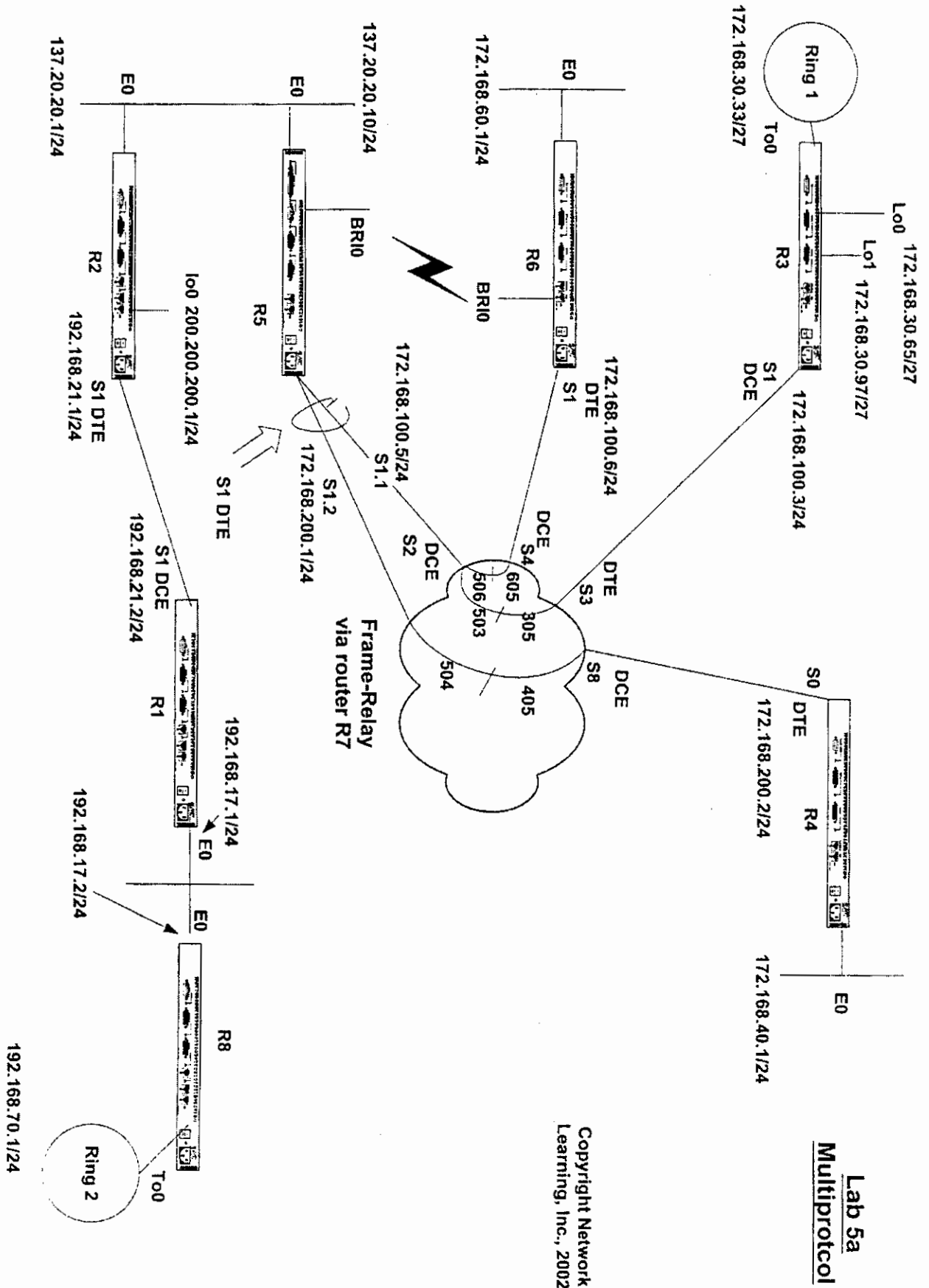
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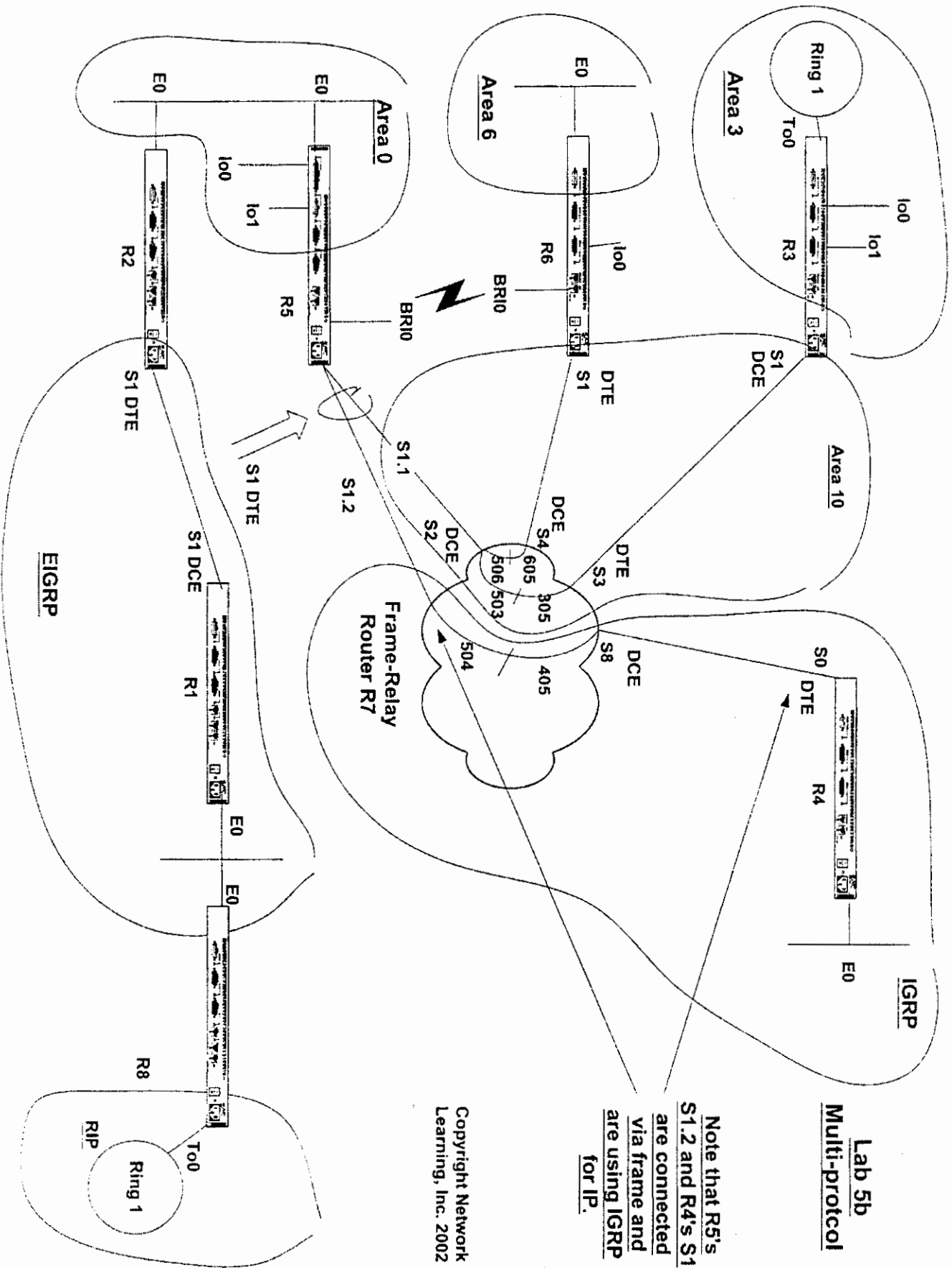
**OSPF
OSPF summarization
OSPF with default route
OSPF virtual-links
IP & IPX
IP RIP
IGRP
Route redistribution
IPX
IP Filtering
BGP with filtering
ISDN DDR with IPX and OSPF
Frame-Relay with multi-point and point-to-point
IPX NLSP with redistribution
IPX SAP filtering
Misc. IPX tuning
DLSW
IPX default route**

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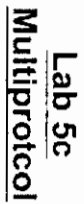
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1. Initial Configuration & OSPF

- How does the administrative distance for EIGRP, IGRP, and OSPF compare? Is it an issue in this lab?
- What routes are put into the routing table?
- You have some serious potential routing loops in this lab.
- What are the OSPF router ID's?
- IGRP doesn't understand the default route 0.0.0.0 0.0.0.0

3. IPX Configuration

- Does NLSP automatically redistribute into EIGRP?
- How does IPX handle split horizon?
- Do you know the following IOS commands; clear ipx cache, clear ipx route, sh ipx cache, sh ipx servers.

4. DLSW Configuration

- What commands allows DLSW connections from non-configured peers?

5. BGP Configuration

When an AS provides transit service to other ASs and if there are non-BGP routers in the AS, transit traffic might be dropped if the intermediate non-BGP routers have not learned routes for that traffic via an IGP. The BGP synchronization rule states that if an AS provides transit service to another AS, BGP should not advertise a route until all of the routers within the AS have learned about the route via an IGP.

You can disable synchronization if one of the following conditions is true:

- Your AS does not pass traffic from one AS to another AS.
- All the transit routers in your AS run BGP.

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Network Learning, Inc. R&S CCIE Practice Lab 5

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At the end of this lab verify connectivity to all ports. **You should be able to ping every interface from any router. (Don't worry about being able to ping a local frame-relay interface. Please disregard this statement if you are asked to filter packets, routes or other specific tasks.)**

1. Initial Configuration & OSPF – 35 pts (2 hours)

- a. Use the pre-configuration files to apply proper IP addresses to the router interfaces. Add IP addresses as needed as shown on the network diagram. You may have to add additional IP addresses to complete some tasks.
- b. Configure router R2's Ethernet interfaces with IP address 137.20.20.1/24 and router R2's default route to 137.20.20.2.
- c. Use a 24-bit mask unless told to use otherwise.
- d. Create a loopback interface on router R2 with 200.200.200.1/24.
- e. Connect routers R3, R4, R5, and R6 over frame-relay. Configure router R5 using sub-interfaces.
- f. Connect routers R3, R4, R5, and R6 over frame-relay. Configure router R5 and router R4 on a different subnet.
- g. Configure OSPF on router R3's interface S1, router R6's interface S1, and router R5's sub-interface S1.1 for OSPF area 10. Place R5's and R2's Ethernet interface in OSPF area 0.
- h. Configure the connection between router R5's interface S1.2 and router R4 for IGRP.
- i. Configure router R6's Ethernet E0 as OSPF area 6. Configure router R3's token-ring interface To0 as OSPF area 3. Configure two loopbacks interfaces on router R3 with networks that contain at most 30 hosts and put both loopbacks in the same area as the token-ring interface. Summarize the loopback subnets and router R3's interface To0 to appear as one route to OSPF.
- j. Make the default route on R2 appear in the routing table of all the other routers.
- k. Configure routers R1, R2's S1, and router R8's Ethernet interface E0 for EIGRP. Configure router R8's interface To0 for RIP.
- l. Redistribute all routes between all routing protocols such that all routes are visible in all routers and every router can ping each other's IP interfaces (even the loopback on R2) as shown on the lab diagram Lab 5a.
- m. Make sure that all OSPF external routes appear as type-1. Verify your routes. Are the routes appearing in the correctly routing protocol?
- n. Configure router R5 such that the only route on R6 for the 137.20.0.0 network appears exactly as follows: O 137.20.20.0 [110/65] via 172.168.100.5, 00:51:03, Serial1. Hint: pay attention to the underlined value 65.
- o. Configure routers R3 & R4 to resolve dns names using DNS servers 207.238.183.71 & 207.238.183.72.

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2. OSPF Demand Circuit – 15 pts (1 hour)

- a. Use network 172.168.65.0/24 for the ISDN interfaces on routers R5 & R6 and add them to OSPF. Configure routers R5 & R6 to use the ISDN interfaces for restoral. The ISDN link should only come up when you administratively shut down the serial 4 interface on router R7, and there is interesting traffic trying to get between routers R5 & R6 (i.e. use ping as the interesting traffic to test. Make sure you test from router R6 and from router R5. See the router ports/configuration info online for the phone #'s, spids, and switch type if you are using our remote racks. Configure the ISDN link so that it will shutdown 45 seconds after an inbound or outbound ping packet. Both routers should have full OSPF routes when the frame link is functional or not.

You are required to use OSPF demand-circuit as your solution here. After the initial ISDN call to synchronize OSPF, your ISDN interfaces should stay down unless you break the frame connection between R5 and R6 and there is interesting traffic.

Now go to router R7 and shut down interface S4. Your ISDN connection should kick in and provide a backup path for router R6 to reach the rest of the network, but only when there is data to send. OSPF router updates should not keep the ISDN up. Pretend your ISDN line is charged at \$5.00 per minute and it comes out of your check.

At this point when router R7's interfaces S4 (your frame connection) is still down, router R5 should have the following displays for; "show ip route", "show ip ospf int bri0", and "show dialer"

Notice that the ISDN connection is down and router R5 has a routing table with OSPF entries using interface BRI0 to get to router R6's Ethernet network, and is suppressing OSPF hellos for 1 neighbor. Also, pay attention to the OSPF dead time on R5's BRI0 interface.

Output from router R5

r5#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
 D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
 N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
 E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
 I - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, * - candidate default
 U - per-user static route, o - ODR

Gateway of last resort is 137.20.20.1 to network 0.0.0.0

137.20.0.0/24 is subnetted, 1 subnets
 C 137.20.20.0 is directly connected, Ethernet0
 172.168.0.0/16 is variably subnetted, 7 subnets, 2 masks

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```
O IA 172.168.30.0/24 [110/65] via 172.168.100.3, 00:09:03, Serial1.1
I 172.168.40.0/24 [100/8576] via 172.168.200.2, 00:01:11, Serial1.2
O IA 172.168.60.0/24 [110/1572] via 172.168.65.1, 00:09:03, BRI0
C 172.168.65.0/24 is directly connected, BRI0
C 172.168.100.0/24 is directly connected, Serial1.1
O 172.168.100.3/32 [110/64] via 172.168.100.3, 00:09:13, Serial1.1
C 172.168.200.0/24 is directly connected, Serial1.2
O E1 192.168.21.0/24 [110/21] via 137.20.20.1, 00:09:03, Ethernet0
O E1 192.168.17.0/24 [110/21] via 137.20.20.1, 00:09:03, Ethernet0
O E1 192.168.70.0/24 [110/21] via 137.20.20.1, 00:09:03, Ethernet0
O*E1 0.0.0.0/0 [110/21] via 137.20.20.1, 00:09:03, Ethernet0
```

r5#show ip ospf int bri0

```
BRI0 is up, line protocol is up (spoofing)
Internet Address 172.168.65.2/24, Area 10
Process ID 1, Router ID 172.168.200.1, Network Type POINT_TO_POINT, Cost: 1562
Run as demand circuit.
DoNotAge LSA allowed.
Transmit Delay is 1 sec, State POINT_TO_POINT,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:06
Neighbor Count is 1, Adjacent neighbor count is 1
Adjacent with neighbor 172.168.100.6 (Hello suppressed)
Suppress hello for 1 neighbor(s)
```

r5#show dialer

BRI0 - dialer type = ISDN

```
Dial String  Successes  Failures  Last called  Last status
4930622      1          0 00:08:45    successful
0 incoming call(s) have been screened.
0 incoming call(s) rejected for callback.
```

BRI0:1 - dialer type = ISDN

```
Idle timer (45 secs), Fast idle timer (20 secs)
Wait for carrier (30 secs), Re-enable (15 secs)
Dialer state is idle
```

BRI0:2 - dialer type = ISDN

```
Idle timer (45 secs), Fast idle timer (20 secs)
Wait for carrier (30 secs), Re-enable (15 secs)
Dialer state is idle
```

r5#

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Now go back to router R7 and bring up router R7's interface S4 again.

3. IPX Configuration – 15 pts (1 hour)

- a. Configure all the active interfaces, including loopbacks, on routers R1, R2, R3, R4, R5, R6, and R8 for IPX.
- b. Configure router R8 and the LAN interfaces on routers R3, R4, R5 and R6 for IPX RIP.
- c. Configure routers R1 & R2 for IPX NLSP.
- d. Configure the serial interfaces on the rest of the routers for IPX EIGRP (not routers R1 & R2 these only use NLSP). Also make the Ethernet interface on router R2 IPX EIGRP only.
- e. Configure the BRI0 interfaces on routers R5 & R6 as IPX RIP.
- f. After this point you should be able to see all the IPX networks in all the routers routing tables. Test connectivity with IPX ping.
- g. Create two static SAPs on router R6.
- h. Filter IPX SAPs such that routers R2, R1, and R8 only see one of the SAPs.
- i. Filter on router R2 such that the IPX network on router R8's interface E0 is not seen by any of the frame-relay connected routers and router R5.
- j. Add support on router R3 for 802.2 and SNAP frame types.
- k. Configure router R4 so that its response to GNS packets is delayed by 1100 milliseconds.

3. IPX DDR Configuration – 15 pts (1 hour)

- a. Configure DDR on routers R5 & R6 using floating statics such that if the Serial 4 interface on router R7 is shut down the BRI interface will provide restoral. Configure your interesting traffic such that IPX rips, saps, watchdogs, and serialization don't bring up the link. Use IPX ping to test your configuration. Make sure that an IPX ping to router R6's Ethernet interface from any router will bring up the link when router R7's Serial 4 interface is administratively shut down. The ISDN link should go down after 45 seconds and never come up again unless another IPX ping packet is sent.

Don't forget to bring up router R7's interface S4 after you test the IPX ISDN portion.

4. DLSW Configuration – 10 pts (30mins)

- a. Configure DLSW between router R3's token-ring 0 and router R4's Ethernet 0.
- b. Add router R2's Ethernet 0 into the DLSW network without using a dlsw remote-peer command on router R3 that points to router R2. Make sure there is DLSW connectivity between all LAN interfaces on routers R2, R3, and R4.

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5. BGP Configuration – 10 pts (30mins)

- a. Configure BGP on routers R3, R4, R5, and R6 and put them in autonomous system 1 (AS1)
- b. Create a static route to null0 on router R4 and inject the route into BGP.
- c. Place routers R2 and R1 in autonomous system 2 (AS2).
- d. Place router R8 in autonomous system 3 (AS3).
- e. Create two loopbacks on router R8 with networks 70.0.0.0/8 and 71.0.0.0/8 and configure router R8 such that these networks are injected into BGP.
- f. Check to see that all routers can see the three BGP routes.
- g. Filter on router R2 such that routers R3, R4, R5, and R6 can only see one of the networks that router R8 originated for BGP.

You have completed lab 5. Compare your configurations to the ones we provided. Often there is more than one to complete a task so your configurations may be different than ours. If your configurations are different than ours make sure you understand how to complete the lab with our configurations too.